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SHELLFISH REPORT
to the
Alaska Board of Fisheries

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INTRODUCTION

Norton Sound

The Norton Sound Section of the Northern Bering Sea District consists of all waters in Registration Area Q that are north of the latitude of Cape Romanzof, east of 168 west longitude, and south of the latitude of Cape Prince of Wales (Figures 1 and 2). A large vessel summer commercial red king crab (Paralithodes camtschatica) fishery has existed in the Norton Sound Section from 1977 through 1992 (Appendix Table 2). No summer commercial fishery occurred in 1991 due to a lack of staff necessary to manage the fishery. The budget had been cut the previous winter. In 1992, the large vessel summer commercial fishery resumed. Regulation changes adopted during the March 1993 Board of Fisheries meeting changed the character of the fishing fleet to that of a small boat fleet. A superexclusive designation went into effect for the Norton Sound commercial crab fishery June 27, 1994. A vessel registered for the Norton Sound crab fishery may not be used to take king crab in any other registration area during that registration year.

The National Marine Fisheries Service conducted their most recent trawl survey to examine the abundance of Norton Sound red king crab in late August 1991 (Appendix Table 5). The results of that survey as compared to the 6 previous trawl surveys show a gradual trend of increasing abundance since the low recorded in 1982. The 1991 survey found 3.4 million pounds of legal king crab in the commercial fishing district. NMFS has not made a survey of Norton Sound since 1991. The quota for the Norton Sound Section for the 1996 season had been set at 340,000 pounds, to approximate an exploitation rate of 10%.

The Alaska Department of Fish and Game conducted a trawl survey to examine the abundance of Norton Sound red king crab from August 7 through August 18, 1996. A population estimate was generated which indicated the legal biomass had declined to 40 percent of the biomass estimated in 1991. The results from the 1996 trawl survey prompted the fishery managers to reduce the harvest rate in the 1997 commercial fishery to five percent of the legal biomass and set the guideline harvest at 80,000 pounds. This is a significant reduction from the previous exploitation rate and guideline harvest.

St. Lawrence Island

The St. Lawrence Island Section lies immediately west and north of the Norton Sound Section. Because the Bering Sea crab fleet bases in Dutch Harbor, the St. Lawrence Island Section has been managed by ADF&G's Westward Region's Dutch Harbor office, until recently, since they have been the primary commercial management group responsible for that area. The only reported commercial catches to date in the St. Lawrence Island Section were made in 1983 when 52,557 pounds of blue king crab were delivered from 13 landings, in 1989, when 3,603 pounds of red king crab and 984 pounds of blue king crab were

delivered from 8 landings, in 1992 when 53 pounds of blue crab were landed and in 1995 when 7,913 pounds were delivered from three landings.

In 1983, the commercial crab fleet concentrated near the southeast shore of St. Lawrence Island. The following year a regulation proposal to close the waters within 10 miles of all inhabited islands within the section was adopted in an attempt to protect stocks targeted by local fishermen and reduce impacts on marine mammal subsistence harvests during the winter. During the 1989 season, three fishing vessels prospecting in that section found relatively few blue king crab near rocks and shoals still open to commercial fishing, but red king crab were discovered in low densities near Kivalina, the northern boundary of the section. The villagers of Little Diomede Island have also traded and sold winter caught blue king crab with residents of Nome and other villages for years. The Department has not been able to obtain an accurate estimate of the magnitude of this trade. The remoteness of this village is also a factor contributing to the lack of catch records. Current regulation allows the commercial harvest and sale of king crab near shore during the winter. The Board provided the same provisions in the regulation as are in effect for Norton Sound to allow a commercial winter fishery. However, local residents of St. Lawrence Island have decided not to export any of their winter catch for commercial sale.

COMMERCIAL FISHERY

Norton Sound Summer Commercial Fishery

The 1997 summer commercial red king crab fishery opened at 12 noon, July 1 in the Norton Sound Section. The first fishing vessel registered July 3. It was after the Fourth of July weekend before any other vessels registered. Fishers did not deliver any crab until July 10. A total of 19 fishing vessels registered for the summer commercial crab season. Beginning in 1996, a moratorium on new vessels, greater than 32 feet, entering the fishery was put in place. No vessels over 32 feet registered in 1997. Thirteen vessels actually made deliveries and 15 permits were fished. There were two land based processors that registered, but only one actually took part in the fishery. No floating crab processors or catcher/processors operated in Norton Sound during the 1997 summer fishery. Therefore, no independent observer was placed on board a commercial vessel. One ADF&G fishery biologist was stationed in Nome to monitor the fishery and sample legal crab delivered to buyers in Nome. This was the only person dedicated to collecting essential biological and management data, which is necessary in determining the magnitude and location of the commercial harvest and tracking the status of the stock. The observer also provides the means to enforce size and sex restriction regulations that protect the resource.

Public concern for declining nearshore catches and the apparent shift in crab distribution caused managers to announce their intent not to relax the nearshore closure line as their practice had been in recent years. As a result of crab distribution and the proximity to the closure line, most vessels traveled to the entrance of Golovin Bay to fish, but only three

vessels chose to operate from the port of Golovin. No samples were collected from those vessels.

Catch reporting logs were kept by buyers and by skippers of catcher vessels for each statistical area fished. Buyers verbal reports were relayed daily by 9:00 a.m. to the ADF&G office in Nome. Fish tickets were due in to the ADF&G office on Friday of each week throughout the duration of the fishery. Vessel reports from fishermen and Catcher/Seller fish tickets were required every Monday for the duration of the fishery. Compliance with reporting requirements was good. Daily catch statistics can be found in Table 1 and Figure 3

Twelve percent of the total harvest was caught by Norton Sound fishers and the remaining 88% of the harvest was caught by Yukon Delta fishers. There were no fishers from other parts of the state or outside of Alaska participating in the fishery this year.

Eleven permit holders were registered as catcher/sellers, but only seventeen landings were made by five fishers registered as catcher sellers. One land based processing company operated out of Nome and one tender was used to transport live crab from Eastern Norton Sound.

Board of Fisheries regulations specific to Norton Sound Section are:

1) 5AAC 34.915, which directs the Department to manage the Norton Sound summer king crab fishery for a harvest of one half the exploitation rate determined under 5AAC 34.080.

2) 5AAC 34.935, which established a closed area with a defined boundary approximating 15 miles from the beach in the Norton Sound section, to protect a long established winter subsistence fishery.

3) 5AAC 34.925 (i) and (j), requiring pot tags and limiting vessels of 125 feet in length or less to 40 pots each and larger vessels are limited to 50 pots.

4) 5AAC 34.906, designates the Norton Sound Section to be a superexclusive registration area.

Statistical Summary

A total of 15 permit holders on 13 catcher vessels made 100 landings in the 1997 Norton Sound summer commercial red king crab fishery. The total number of crab caught was 32,606 and the total number of pots pulled was 2,982 (Table 1). The CPUE was 10.9 crab/pot. Total harvest was 92,988 pounds of king crab. The harvest goal was 80,000 pounds. The exvessel price for crab was $1.98 per pound. The value of the 1997 fishery is estimated at $184,116. This is the smallest summer commercial harvest since the

Norton Sound crab fishery transition to a small vessel fishery in 1993 (Appendix Tables 2 & 3, Figure 7).

Fish ticket records show that the 1997 season's largest fishing effort (67%) and harvest (83%) occurred in statistical areas 636401 and 626401(Table 2) just south of Golovin Bay. Prior to 1995, the fishery had typically concentrated in statistical areas south of Nome. In 1995, fishing started in the usual areas, but catches were low and fishermen spread their effort. Late in the season the best catch rates were found in the statistical areas south of Golovin Bay. Comparisons of the annual summer commercial harvest of crab by statistical area can be found in Appendix Table 1.

Based on fish ticket data, statistical area 626401 had the greatest CPUE of 14.2 crab/pot (Table 2). Overall CPUE for the 1997 season was 10.9 crab/pot. Appendix Tables 2 and 3 equate previous commercial crab harvest, effort, CPUE and value to the 1997 season. During the 1997 fishery, there were approximately 520 pots on the fishing grounds. The mean CPUE of the previous three years with a similar number of pots deployed on the grounds is 28.7 (Appendix Tables 2 and 3).

Statistical areas 656330 and 636330 had the greatest average weights of 3.05 pounds per crab according to fish ticket data (Table 2). Overall average weight per crab for the 1997 season was 2.85 pounds. This compares to the combined average weight of 2.98 pounds of the previous four years.

Commercial Catch Sampling

Carapace length measurement and shell age were collected from 1,198 legal male red king crab throughout the duration of the 1997 summer fishery. Carapace age was classified as new (11 months old) or old (at least 23 months old) (Table 3, Figure 4). Overall mean carapace length of the legal male red king crab sampled was 115.7mm (Table 3). The 1997 season's legal male new shell/old shell ratio was 86% new shell to 14% old shell (Table 3). This compares to the previous year average of 64% new shell to 36% old shell. Generally, the 1997 proportion of new shelled crab is high.

Recruit king crab made up 49% of the harvested stock sampled during the 1997 commercial season (Table 3). Total post recruits made up 51% of the harvested stock sampled. This high level of recruitment has not been observed since the mid-1980s when the population was recovering from a period of intense harvest (Appendix Table 4).

No sublegal male or female king crab information was collected from commercial vessels during the 1997 summer commercial king crab fishery. The small size of the vessels and the opportunistic excursion schedule made onboard sampling unfeasible.

Tagged Crab

Eight tagged crab were recovered during the 1997 summer fishery. Two of those crab were not documented properly at the time of release and that data was not usable. Of the remaining six crab recaptured during 1997, mean growth per molt was 12.9mm.

Enforcement

The Fish and Wildlife Protection officer was unable to patrol the fishery. No cases were filed during 1997.

Norton Sound Winter Commercial Fishery

Regulation allows a winter commercial fishery in the Norton Sound Section from November 15 through May 15, the fishery typically takes place near Nome. The winter commercial fishery is required to take place from the ice, not from vessels. During the winter of 1996-1997, two commercial fishermen reported selling a total of 83 red king crab (Appendix Table 7). The villages east of Nome reported only limited harvests of crab. Ice conditions were generally unfavorable throughout Norton Sound, although the sea ice near Elim was fairly stable. Poor catch rates at Nome and unstable ice to the east kept king crab fishing to some of the lowest levels in recent years.

The harvest is divided between local residents who buy crab directly from the fishermen and other non-local markets such as Anchorage. Crab are sold in Nome for six dollars per crab, roughly $2.85 per pound. Because of the poor harvest rate, there were no crab sold out of town. The 1996-1997 winter catch of 210 pounds was estimated to be worth about 598 dollars.

The winter crab fishermen generally use crab pots but some use handlines to "prospect". Deploying pots through sea ice is laborious, but hand lines can be dropped through a large ice auger hole in a short period of time. The other advantage of hand lines is that during periods of favorable weather hand lines may be deployed from new, less stable ice without the risk of loosing more expensive crab pots. Most fishermen consider commercial crabbing a sideline and hold other jobs. Usually, two or three of the winter crab fishermen sell the majority of the crab. Because the volume of crab involved is low, no processor has found it profitable to operate locally. The crab sold locally are all sold fresh as are those shipped to Anchorage or other non local markets. During the mid-winter months, fishermen find it difficult keeping the crab from freezing. Many Nome residents prefer to buy frozen crab since they are able to extract the meat prior to cooking. Fresh frozen crab are easily marketed in Nome, but are not accepted in Anchorage markets.

SUBSISTENCE FISHERY

Red king crab are utilized by Norton Sound residents mainly during the winter. Fishing occurs through cracks or holes cut in the ice with the use of handlines and pots. In order to document trends in the subsistence harvest, the Board of Fisheries enacted a regulation in 1977 requiring subsistence fishermen in Norton Sound to obtain a permit prior to fishing and to record daily effort and catches on these permits (Appendix Table 6).

The first year subsistence permits were required had the highest number of permits issued to date and a relatively high harvest rate were recorded. The fishery declined sharply the following year and remained at very depressed levels throughout the 1981-82 season. The lack of success in the winter crab fishery during some past years has been attributed to a declining crab population caused by the removal of crab in the summer commercial fishery together with low recruitment, low effort due to poor ice conditions, and changes in the nearshore winter distribution of crab. All these factors probably had some effect on the success of the winter fishery in varying degrees. During the 1978-79 winter fishery, the king crab population was still in relatively high abundance. Despite this relatively large population, winter catches were the poorest on record indicating that the major factors limiting winter catches were probably poor ice conditions and the distribution of crab. During the winter of 1981-82, poor winter catches could more reasonably be attributed to a declining crab population since the crab population was at a much lower level. Subsistence fishing success during the winters of 1982-83 through 1986-87 had improved due to a rebuilding of the population and increased use of more efficient gear (pots instead of handlines). Unstable ice conditions and record snowfalls adversely effected the 1987-88, 1988-89, and 1992-93 catches. During years of stable ice conditions, approximately 100 fishermen have averaged 100 crab each.

The 1996-1997 season was beset with poor ice conditions. Frequent storms limited the extent of the shorefast ice and fishers had difficulty keeping their pots and finding suitable locations to fish. Of the 18 permits returned, 10 reported fishing. Seven fishers reported using pots, 1 reported using handlines, and 2 reported using a combination of the two gears. Permit data indicates the subsistence harvest consisted of 697 male crab and nine female crab. Those fishers reported harvesting 58% of the male crab they caught and 2% of the females caught.

STOCK STATUS / RESEARCH

There has been a change in the character of the summer commercial fishery since 1993 due to regulation changes affecting pot limits, opening dates and a regulation making Norton Sound a superexclusive registration area. The quality and quantity of data collected since the 1993 summer crab fishery has differed greatly from previous years due to the nature of the small vessel fishery. No floating processor or catcher processor took part in the 1997 fishery, therefore no independent observers were onboard commercial vessels.

The ADF&G fishery monitor did not have the opportunity to make observations on small catcher vessels during the 1997 fishery. No information was collected on observed pot lifts, sublegal male and female length frequencies, and catch rates of legal and sublegal crab during the commercial fishery. However, sampling of the commercial catch did occur on some deliveries made in Nome. This is important to ensure size limits are being enforced, and to assist management biologists in determining recruitment and health of the crab population.

In 1976, when monitoring of the Norton Sound king crab population first began, the population was mainly composed of prerecruit and recruit crab. The initial population assessment survey by the NMFS estimated the legal male king crab population at 8.1 million pounds (Appendix Table 5). The legal male crab population peaked in 1978 at an estimated 11 million pounds. During the 4 years following 1978, recruitment into the legal male crab population was very low. Subsequent NMFS surveys in 1979 and 1982 documented a population of predominantly postrecruit crab, and estimated the population had declined to 2.6 million pounds by 1982. Beginning in 1981, sublegal crab abundance began to increase, and by 1983 recruitment into the legal male population also began to increase. No assessment work was conducted in 1983 or 1984. However, samples of the commercial catches indicated a significant increase of recruit crab into the legal male population; from a historic low of 10% in 1981 to 59% in 1984.

In 1985, both NMFS and ADF&G conducted population assessment surveys in Norton Sound (Appendix Table 5). After the commercial fishery in 1985, NMFS conducted a population assessment survey using trawl gear over a slightly larger area than that surveyed by the Department. Male king crab sampled in NMFS trawls were in the process of or had just molted with the result being that their estimate of 3.4 million pounds of legal male king crab included some recruitment. Adjusting this estimate for molting, and including the summer commercial harvest, an estimated three million pounds were present prior to the 1985 August fishery. Both surveys documented relatively substantial numbers of recruit crab and a healthy percentage of prerecruit crab.

During September of 1988 NMFS conducted a fifth population assessment with trawl gear. They sampled an area roughly the same size as in 1985, but increased sampling frequency in the proposed mineral lease area near Nome. The timing of the study, which occurred during the male molt, was almost a month earlier than similar surveys in the past. Nearly all the 1988 catch was in pre-molt condition. NMFS estimated 3.0 million pounds of legal male and 1.0 million pounds of prerecruit-one male red king crab; totaling 4.0 million pounds. Annual mortality was estimated at approximately 20% or 0.8 million pounds. Ignoring growth and the winter harvests, the population prior to the 1989 summer fishery would have been 3.2 million pounds, very close to the 1985 trawl estimate of 3.4 million pounds.

NMFS conducted a sixth trawl survey of Norton Sound during late August 1991 with a reduced number of tows. Each station had only a single sampling tow, as compared to each station having both a day and night tows during previous surveys. This reduction in

sampling had the effect of introducing more variability into the estimate. The legal crab biomass in the summer fishing area was estimated to be 3,400,000 pounds and the total Norton Sound legal biomass was estimated to be 4,009,000 pounds. Since the survey occurred prior to the molt, a mortality of 10% was assumed for the year following the estimate. With no summer or winter fishery data to compare with the survey results, a conservative biomass of 3,400,000 pounds was used as the basis for the 1992-96 harvest guideline. The Norton Sound red king crab population was thought to be stable with harvest set near 10%.

NMFS has discontinued their trawl surveys of Norton Sound. The Department was able to utilize recently appropriated money for a trawl survey of their own during August of 1996. The methodology used was very similar to that used by NMFS in previous surveys. The legal biomass was estimate to be 1,600,000 pounds. This is a significant decline from the previous survey. Department staff met and decided that the population was far below its carrying capacity and was closely approaching the threshold below which a commercial harvest should not occur. There are indications that the sublegal portion of the population is relatively strong in comparison to the legal portion. It was decided that the exploitation rate would be reduced to five percent of the legal biomass. This reduced harvest rate and the expected strong recruitment will allow for a rapid recovery if the legal biomass.

FUTURE INVESTIGATIONS

The trawl survey which occurred during the summer of 1996 in Norton Sound was made possible by a budget increment passed by the legislature. This is to be a regularly scheduled survey rotating between districts. Both funding for a sustained winter research program and a triennial trawl survey to evaluate Norton Sound crab populations were provided for in that legislation. A winter pot survey is planned during February, March, and April 1998 and the next trawl survey to generate a population estimate is planned for 1999.

OUTLOOK FOR 1998

The outlook for 1998 is not yet complete. The guideline harvest is likely be to the same as the 1997 season; however, the winter pot survey will be used to check the projections generated from the trawl survey.

Table 1. Daily catch (using fish ticket data) for the commercial king crab harvest, Norton Sound Section, Eastern Bering Sea, July 1 - August 13, 1997.

Date	Permits	Landings	Number of Crab	Lbs of Crab Harvested	Cumulative Total (lbs)	No. of Pots Pulled	Average Weight	CPUE
10-Jul [a]	2	2	255	673	673	71	2.64	3.6
11-Jul	1	1	154	397	1,070	19	2.58	8.1
12-Jul	3	3	659	1,832	2,902	121	2.78	5.4
13-Jul	4	4	1,046	2,898	5,800	160	2.77	6.5
14-Jul	0	0	0	0	5,800	0	0.00	0.0
15-Jul	1	1	260	765	6,565	40	2.94	6.5
16-Jul	5	5	1,357	3,681	10,246	195	2.71	7.0
17-Jul	2	2	518	1,477	11,723	80	2.85	6.5
18-Jul	3	8	384	1,160	12,883	123	3.02	3.1
19-Jul	1	1	9	27	12,910	2	3.00	4.5
20-Jul	2	3	371	1,053	13,963	82	2.84	4.5
21-Jul	4	4	418	1,157	15,120	84	2.77	5.0
22-Jul	4	4	1,281	3,886	19,006	132	3.03	9.7
23-Jul	3	3	1,368	3,703	22,709	73	2.71	18.7
24-Jul	0	0	0	0	22,709	0	0.00	0.0
25-Jul	1	1	15	45	22,754	2	0.00	7.5
26-Jul	0	0	0	0	22,754	0	0.00	0.0
27-Jul	1	1	51	155	22,909	6	0.00	8.5
28-Jul	7	7	2,629	7,632	30,541	273	2.90	9.6
29-Jul	2	2	1,107	2,941	33,482	63	2.66	17.6
30-Jul	4	4	1,656	4,663	38,145	128	2.82	12.9
31-Jul	3	3	991	2,809	40,954	144	2.83	6.9
1-Aug	3	3	1,110	3,244	44,198	160	2.92	6.9
2-Aug	3	4	635	1,884	46,082	96	2.97	6.6
3-Aug	weather	0	0	0	46,082	0	0.00	0.0
4-Aug	weather	0	0	0	46,082	0	0.00	0.0
5-Aug	2	3	17	51	46,133	6	3.00	2.8
6-Aug	4	5	844	2,395	48,528	139	2.84	6.1
7-Aug	8	8	4,072	11,783	60,311	247	2.89	16.5
8-Aug	1	1	10	30	60,341	2	3.00	5.0
9-Aug	4	4	3,658	10,166	70,507	160	2.78	22.9
10-Aug	3	3	1,211	3,360	73,867	72	2.77	16.8
11-Aug	0	0	0	0	73,867	0	0.00	0.0
12-Aug	1	1	558	1,572	75,439	20	2.82	27.9
13-Aug [b]	9	9	5,962	17,549	92,988	282	2.94	21.1
Totals:	15	100	32,606	92,988		2,982	2.85	10.9

[a] Fishery opened by regulation 12 noon July 1. No deliveries made until 7/10.

[b] Fishery closed by emergency order August 13, 12 noon.

Table 2. Red king crab summer commercial catch total (from fish ticket reports) by statistical area for Norton Sound Section, Eastern Bering Sea, July 1 - August 13, 1997.

Statistical Area	Number	Pounds	Pots Pulled	CPUE	Average Weight (Lbs.)	Percent of Pots Pulled in Stat. Area (%)	Percent Harvest in Stat. Area (%)
626401	6,242	18,066	440	14.2	2.89	14.8	19.4
636330	1,260	3,838	120	10.5	3.05	4.0	4.1
636401	21,027	59,206	1,515	13.9	2.82	50.8	63.7
646330	120	314	80	1.5	2.62	2.7	0.3
646401	389	1,052	81	4.8	2.70	2.7	1.1
656330	1,528	4,661	313	4.9	3.05	10.5	5.0
656401	1,368	4,035	301	4.5	2.95	10.1	4.3
666401	672	1,816	132	5.1	2.70	4.4	2.0
Total:	32,606	92,988	2,982	10.9	2.85		

Table 3. Carapace length measurement summary of sampled legal male red king crab captured during the commercial king crab harvest, Norton Sound Section, Eastern Bering Sea, July 1 - August 13, 1997.

Carapace Length (mm)	New shell No.	New shell Ave Length Calc.	New shell %	Old shell No.	Old shell Ave Length Calc.	Old shell %	Total No.	Total Ave Length Calc.	Total %
95	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
96	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
97	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
98	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
99	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
100	3	0.29	0.3%	0	0.00	0.0%	3	0.25	0.3%
101	7	0.69	0.6%	1	0.60	0.1%	8	0.67	0.7%
102	12	1.19	1.0%	1	0.61	0.1%	13	1.11	1.1%
103	13	1.30	1.1%	2	1.23	0.2%	15	1.29	1.3%
104	19	1.92	1.6%	4	2.49	0.3%	23	2.00	1.9%
105	34	3.46	2.8%	3	1.89	0.3%	37	3.24	3.1%
106	42	4.32	3.5%	10	6.35	0.8%	52	4.60	4.3%
107	26	2.70	2.2%	5	3.20	0.4%	31	2.77	2.6%
108	34	3.56	2.8%	10	6.47	0.8%	44	3.97	3.7%
109	48	5.07	4.0%	7	4.57	0.6%	55	5.00	4.6%
110	61	6.51	5.1%	3	1.98	0.3%	64	5.88	5.3%
111	55	5.92	4.6%	8	5.32	0.7%	63	5.84	5.3%
112	73	7.93	6.1%	8	5.37	0.7%	81	7.57	6.8%
113	46	5.04	3.8%	9	6.09	0.8%	55	5.19	4.6%
114	47	5.20	3.9%	3	2.05	0.3%	50	4.76	4.2%
115	67	7.47	5.6%	5	3.44	0.4%	72	6.91	6.0%
116	50	5.63	4.2%	5	3.47	0.4%	55	5.33	4.6%
117	53	6.01	4.4%	3	2.10	0.3%	56	5.47	4.7%
118	42	4.81	3.5%	7	4.95	0.6%	49	4.83	4.1%
119	34	3.92	2.8%	4	2.85	0.3%	38	3.77	3.2%
120	32	3.72	2.7%	16	11.50	1.3%	48	4.81	4.0%
121	34	3.99	2.8%	2	1.45	0.2%	36	3.64	3.0%
122	24	2.84	2.0%	5	3.65	0.4%	29	2.95	2.4%
123	26	3.10	2.2%	0	0.00	0.0%	26	2.67	2.2%
124	17	2.04	1.4%	5	3.71	0.4%	22	2.28	1.8%
125	19	2.30	1.6%	4	2.99	0.3%	23	2.40	1.9%
126	15	1.83	1.3%	2	1.51	0.2%	17	1.79	1.4%
127	12	1.48	1.0%	5	3.80	0.4%	17	1.80	1.4%
128	17	2.11	1.4%	2	1.53	0.2%	19	2.03	1.6%
129	10	1.25	0.8%	4	3.09	0.3%	14	1.51	1.2%
130	11	1.39	0.9%	3	2.34	0.3%	14	1.52	1.2%
131	5	0.64	0.4%	2	1.57	0.2%	7	0.77	0.6%
132	8	1.02	0.7%	2	1.58	0.2%	10	1.10	0.8%
133	5	0.65	0.4%	3	2.39	0.3%	8	0.89	0.7%
134	3	0.39	0.3%	0	0.00	0.0%	3	0.34	0.3%
135	4	0.52	0.3%	3	2.43	0.3%	7	0.79	0.6%
136	4	0.53	0.3%	1	0.81	0.1%	5	0.57	0.4%
137	2	0.27	0.2%	1	0.82	0.1%	3	0.34	0.3%
138	4	0.54	0.3%	0	0.00	0.0%	4	0.46	0.3%
139	3	0.40	0.3%	3	2.50	0.3%	6	0.70	0.5%
140	2	0.27	0.2%	0	0.00	0.0%	2	0.23	0.2%
141	1	0.14	0.1%	3	2.53	0.3%	4	0.47	0.3%
142	2	0.28	0.2%	0	0.00	0.0%	2	0.24	0.2%
143	2	0.28	0.2%	2	1.71	0.2%	4	0.48	0.3%
144	2	0.28	0.2%	0	0.00	0.0%	2	0.24	0.2%
145	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
146	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
147	0	0.00	0.0%	1	0.88	0.1%	1	0.12	0.1%
148	1	0.14	0.1%	0	0.00	0.0%	1	0.12	0.1%
149	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
150	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
Total No.	1,031		86.1%	167		13.9%	1,198		100.0%
Mean		115.3			117.8			115.7	

Total legals	1,198
Total Recruits	587
Percent	49.0%
Total Post Recruits	611
Percent	51.0%

Table 4. Red king crab tag information recovered during the Norton Sound commercial king crab harvest, July 1 - August 13, 1997.

Tag Number	Capture Date	Stat. Area of Capture	Carapace Length (mm)	Shell Age	Tagging Date	Tagging Location[b]	Carapace Length (mm)	Growth (mm)	No. of Molts[a]	Skip Molts	Average Growth per Molt (mm)
NX03863	7/21/97	656401	103	New	4/3/96	B4	89	14	1	0	14.0
NZ02503	7/28/97	636401	109	New	3/7/95	E3	80	29	2	0	14.5
NX03317	7/30/97	656330	121	New	4/4/95	E4	97	24	2	0	12.0
NX03529	7/31/97	626401	112	New	No Information						
NX03353	8/7/97	636401	122	Old	2/13/96	N3	127	-5			
NX03105	8/7/97	636401	125	New	3/16/95	W4	118	7	1	1	7.0
NX03990	8/13/97	636401	108	New	3/29/96	B1	90	18	1	0	18.0
NX02900	8/14/97	636401	112	New	3/7/95	E4	88	24	2	0	12.0
											12.9

[a] Crab growth of 12 mm (+/- 5mm) per year is thought to be the average growth in one molting period.

[b] B1= Bluff area, 45 miles east of Nome.
B4=Bluff area, 50 miles east of Nome.
E3=7.9 miles east of Nome.
E4=9.5 miles east of Nome.
N3=1.34 miles south of Nome.
W4=2.8 miles west of Nome.

Figure 1. King crab fishing districts and sections of Statistical Area Q.

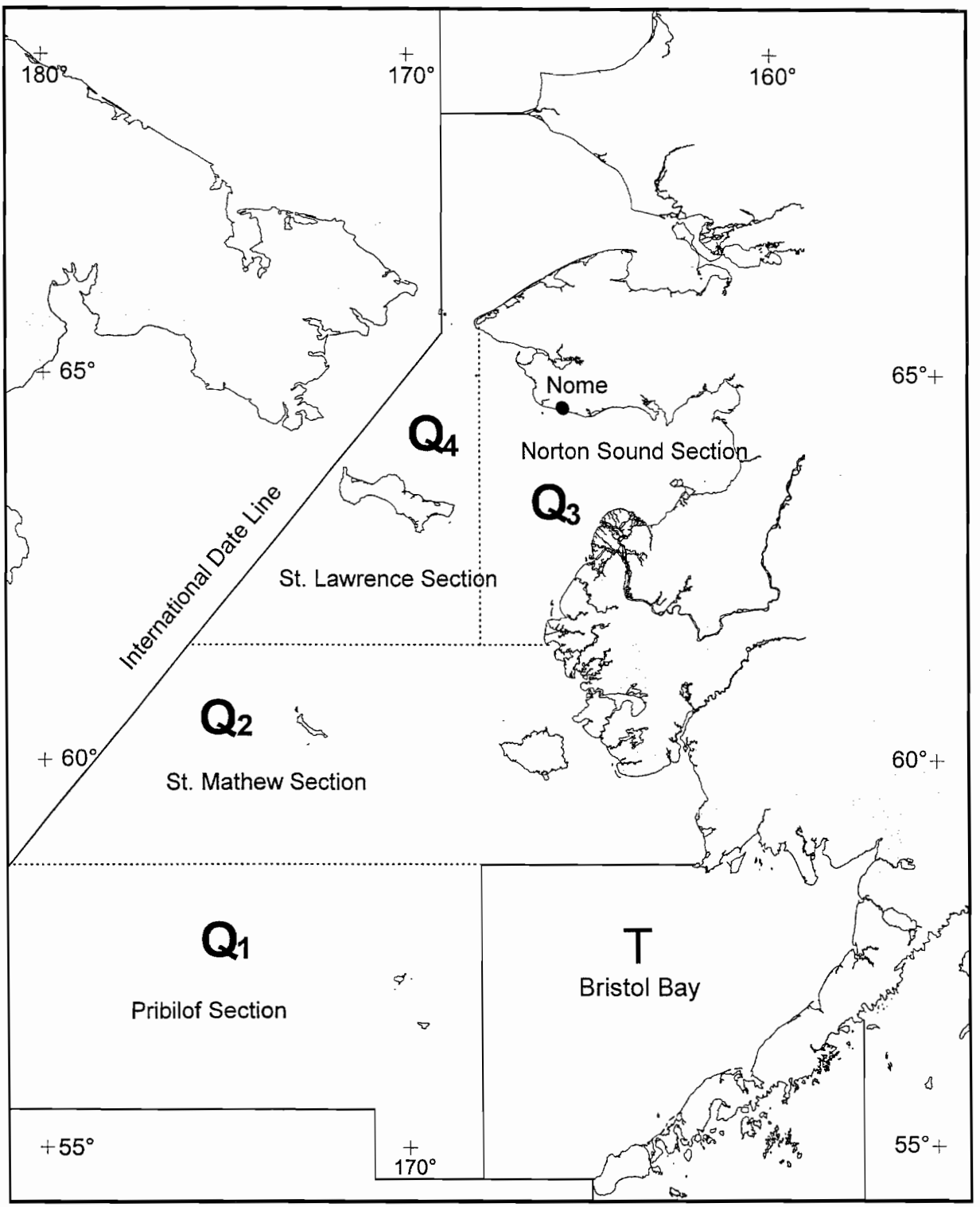
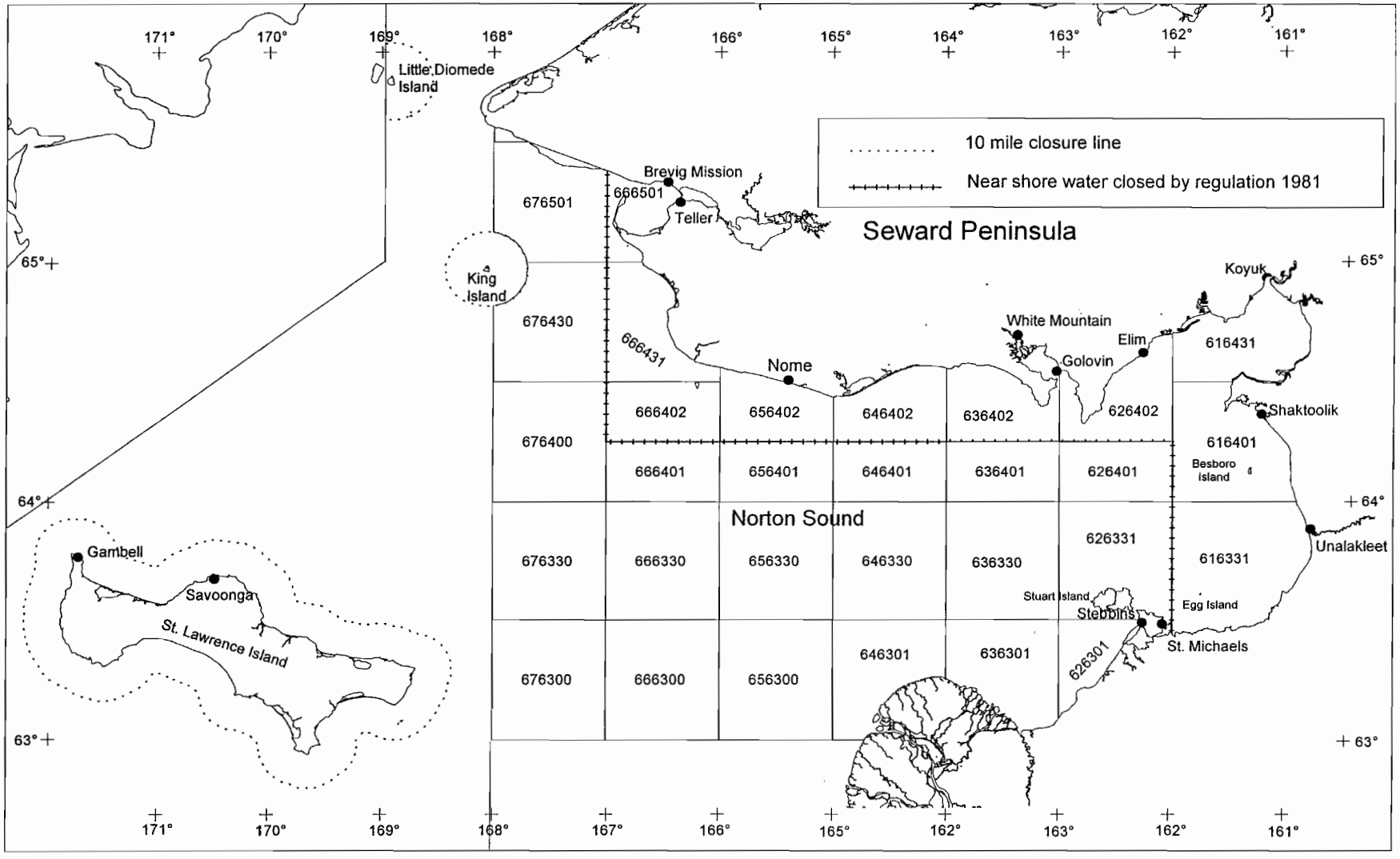


Figure 2 . Norton Sound red king crab statistical areas.



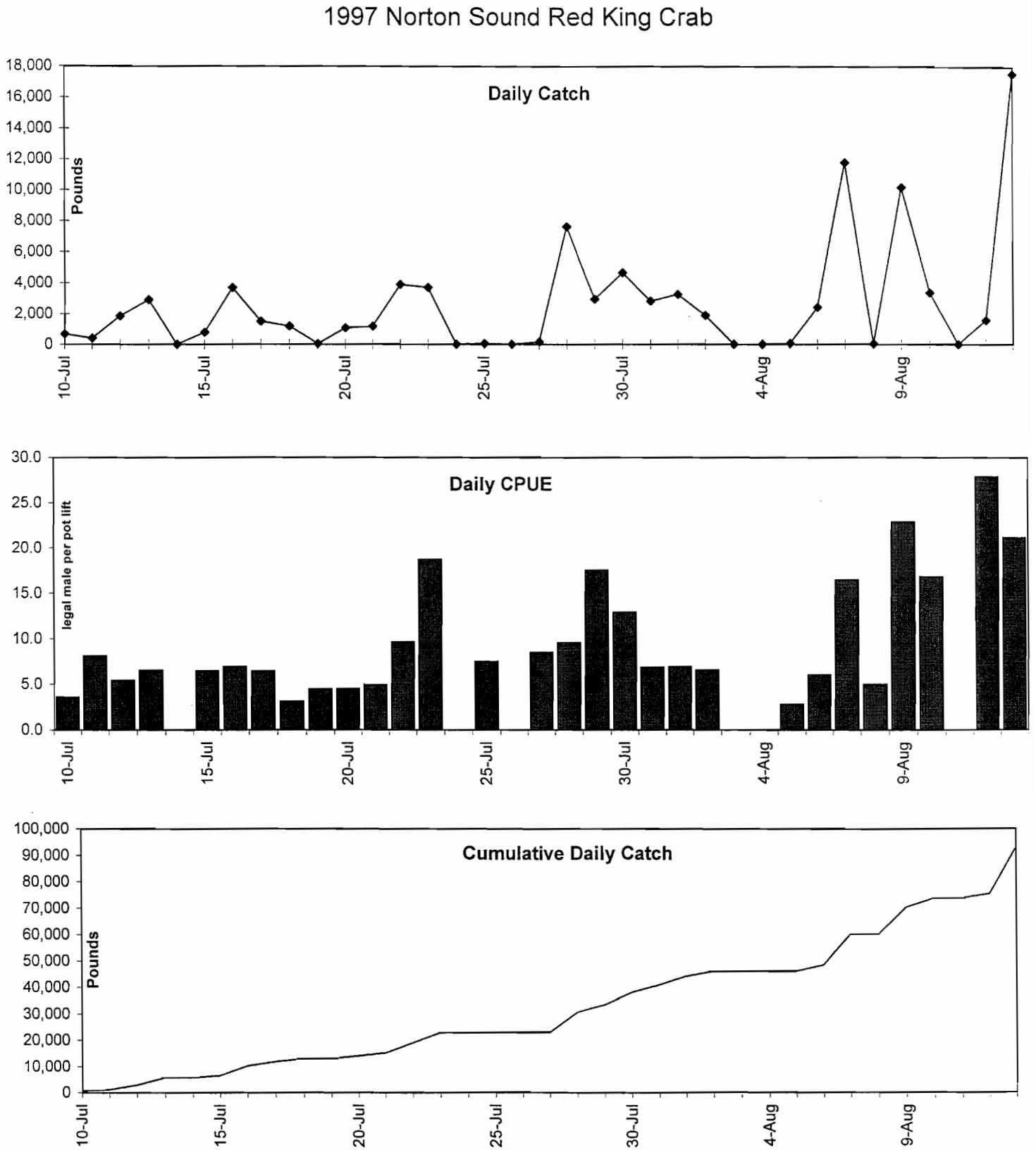


Figure 3. Daily catch, daily CPUE, and cumulative daily catch, Norton Sound summer commercial king crab fishery, July 10 - August 13, 1997 (no harvest reported prior to July 10).

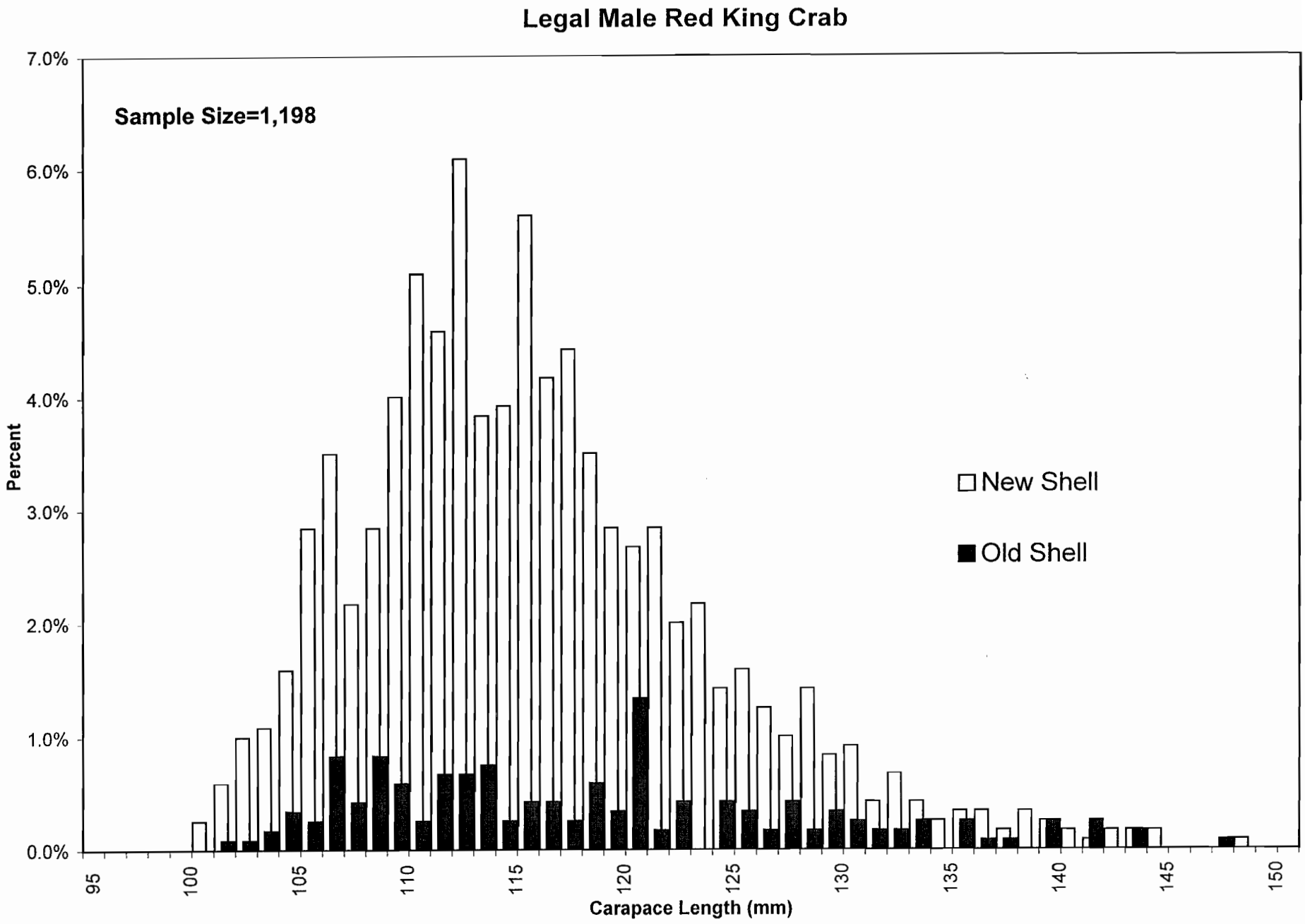


Figure 4. Length frequency distribution of new and old carapace age condition of legal male red king crab, Norton Sound summer king crab fishery, July 1 - August 13, 1997.

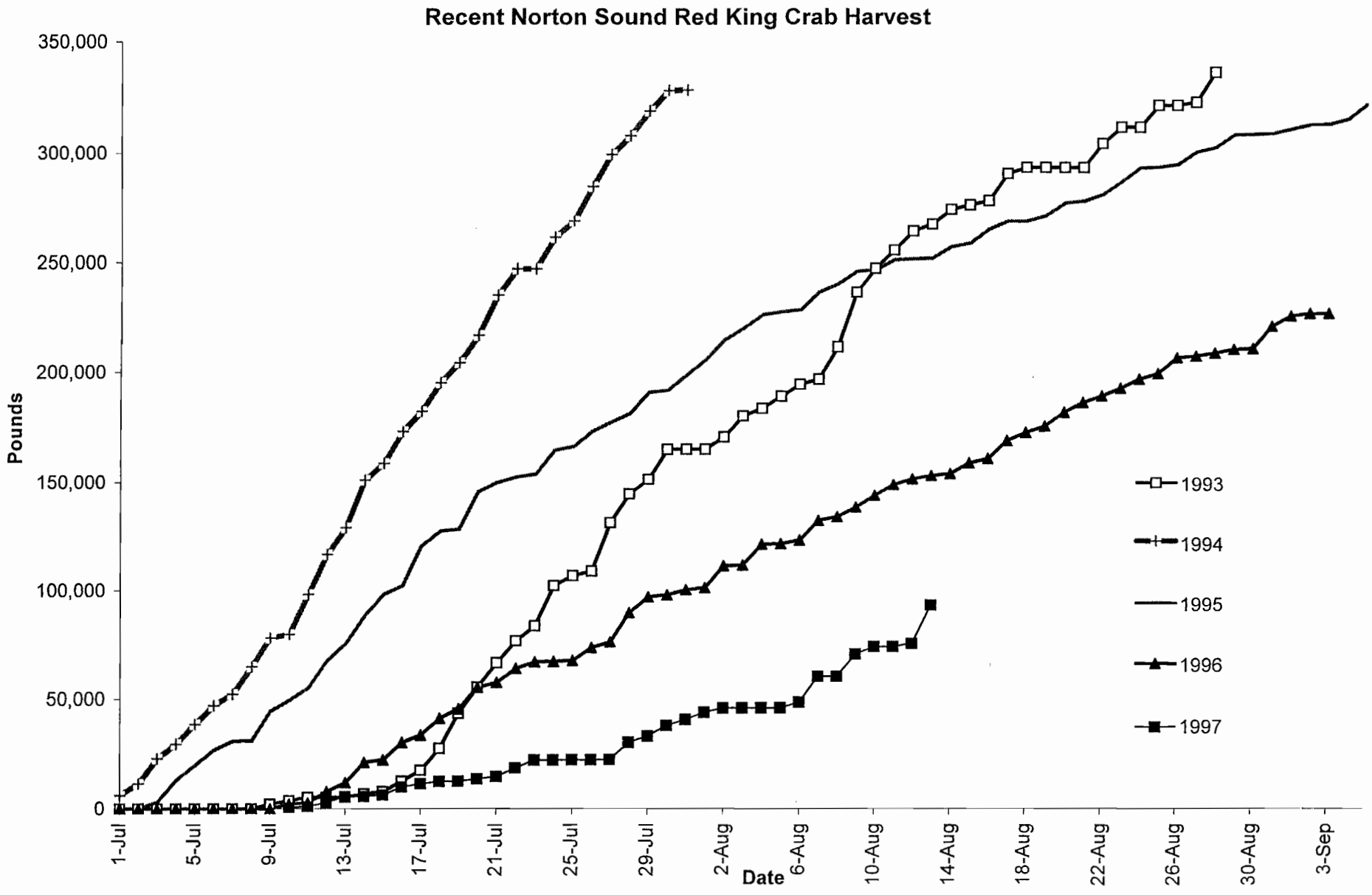


Figure 5. Recent Norton Sound summer commercial red king crab harvest, 1993 - 1997. The 1993 - 1996 harvest guideline was 340,000 lbs. The 1997 harvest guideline was 80,000 lbs.

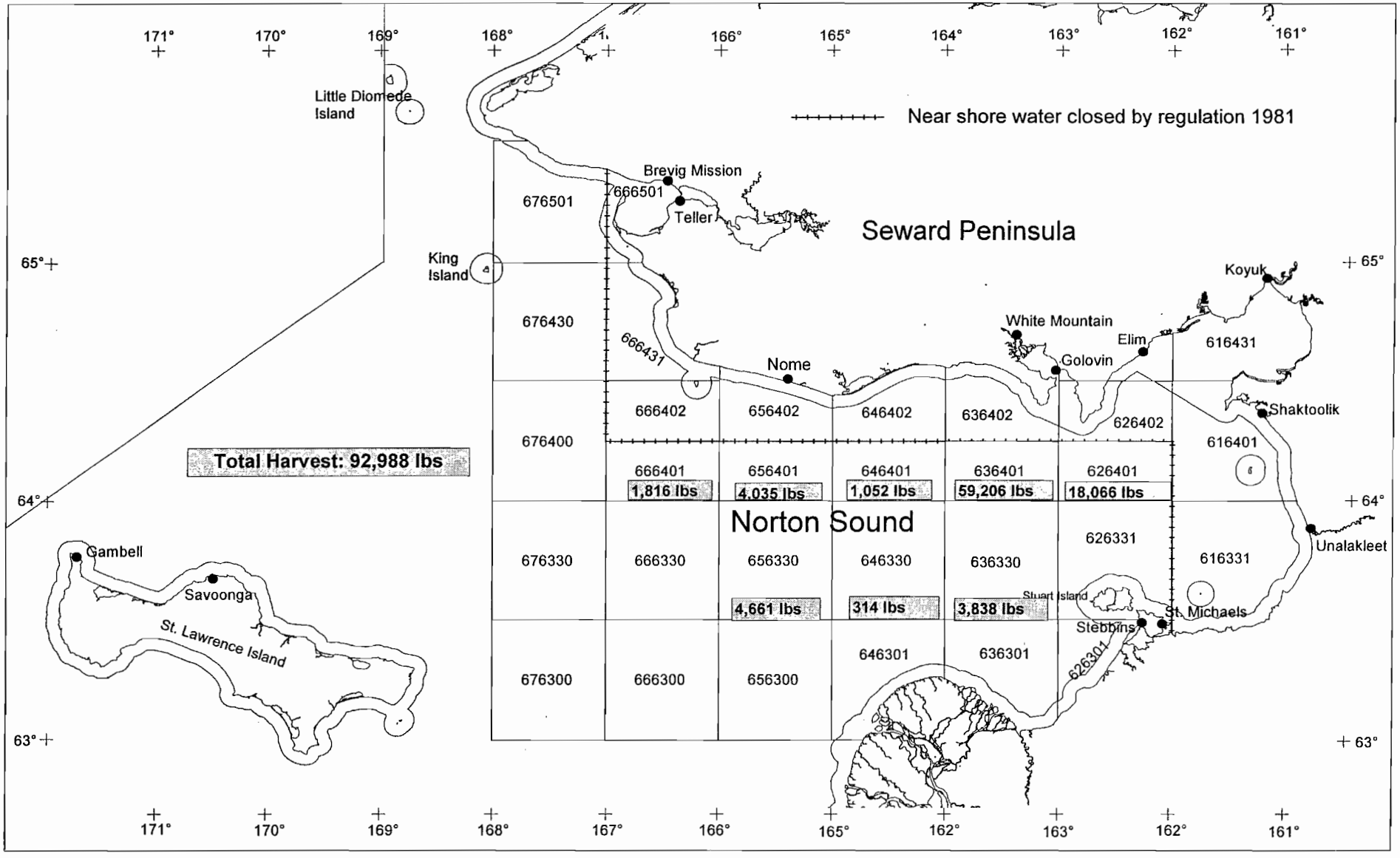


Figure 6. 1997 Norton Sound summer commercial red king crab harvest by statistical areas.

Appendix Table 1. Comparison of annual summer commercial harvest of red king crab from Norton Sound Section, Eastern Bering Sea, by statistical areas, 1977-1997 (catch in pounds) [a]

Statistical Area	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1994	1995	1996[b]	1997	Totals
616331	7,893																48				7,941
616401																		35			35
626331	40,020					22													61		40,103
626401	31,572			4,830	399													18,971	45,045	18,066	100,817
626402	38,995																				38,995
636330																			4,560	3,838	4,560
636401				12,398	61,823	32,246	5,880	41	891				22,030		1,159	1,373	8,087	24,329	70,677	59,206	240,934
636402																	1,754	3,466			5,220
646301																		4,628	13,888		18,516
646330					4,716								5,212					1,493	2,894	314	14,315
646401			155,972		1,319	17,532										1,963	37,222	105,045	22,834	1,052	341,887
646402	80,969					748										730	143,511	66,821			292,779
656300			161,699		15,174																176,873
656330			323,518	72,735	395,662	3,983	24,246	83,479	7,632		79,006	36,129	1,757		4,814	265		19,745	15,446	4,661	1,068,417
656401			138,011	121,147	253,387	60,480	11,422	183,119	246,200		194,408	165,644	100,956	171	53,119	105,341	29,566	32,289	9,985	4,035	1,705,245
656402	306,302	90,187	288,869	918	3,098	2,832			132,363							193,079	106,053	44,000			1,167,701
666230		55,490			77																55,567
666300		162,795	60,816	84,874	9,167	95		4,534											25,519		347,800
666330		353,016	505,050	367,446	141,513	8,990	1,192		389	70,615	2,963	13,020	1,275	27,185	4,305	31,758		730			1,529,447
666401		179,212	486,947	205,400	381,510	79,580	325,045	116,254	5,341	408,848	50,744	21,895	115,257	162,263	10,632	746	396		3,001	1,816	2,553,071
666402	12,036	515,778	534,938	183,581		17,585			32,992							535	1,221				1,298,666
666431			146,029															1,124			147,153
676300		13,238		126,231															546		140,015
676330		51,304	81,798	6,762	18,734																158,598
676400		667,130	33,856	274	92,026	1,315	247		32					3,212					9,775		807,867
676430		3,811	12,309		373	3,513			1,171												21,177
676501					36																36
686330			1,860																		1,860
Totals	517,787	2,091,961	2,931,672	1,186,596	1,379,014	228,921	368,032	387,427	427,011	479,463	327,121	236,688	246,487	192,831	74,029	335,790	327,858	322,676	224,231	92,988	12,378,583

[a] No commercial fishery occured in 1991.

[b] Does not include approximately 2,490 lbs not reported on fish tickets.

Appendix Table 2. Historic summer commercial red king crab harvest, Norton Sound Section, Eastern Bering Sea, 1977 - 1997.

Year	Number of Vessels	Number of Permits	Number of Landings	Number of Crab	Harvest (lbs) [a,b]	Number of Pot Lifts	CPUE	Percent Old Shell	Average Weight (lbs)	Avg. Legal Mean Length (mm)
1977	7	7	13	195,877	0.52	5,457	36	[d]	2.7	113.4
1978	8	8	54	660,829	2.09	10,817	64	[d]	3.0	118.9
1979	34	34	76	970,962	2.93	34,773	28	[d]	3.0	119.8
1980	9	9	50	329,778	1.19	11,199	29	[d]	3.6	125.8
1981	36	36	108	376,313	1.38	33,745	11	[d]	3.7	128.5
1982	11	11	33	63,949	0.23	11,230	6	[d]	3.6	125.4
1983	23	23	26	132,205	0.37	11,195	12	[d]	2.8	115.2
1984	8	8	21	139,759	0.39	9,706	14	[d]	2.8	112.5
1985	6	6	72	146,669	0.43	13,209	11	[d]	2.9	115.8
1986	3	3	[d]	162,438	0.48	4,284	38	[d]	2.9	115.9
1987	9	9	[d]	103,338	0.33	10,258	10	13	3.2	121.7
1988	2	2	[d]	76,148	0.24	2,350	32	26	3.1	119.0
1989	10	10	[d]	79,116	0.25	5,149	15	29	3.1	119.8
1990	4	4	[d]	59,132	0.19	3,172	19	17	3.1	121.1
1991 [c]										
1992	27	27	[d]	24,902	0.07	5,746	4	29	3.0	119.7
1993	14	20	208	115,913	0.33	7,063	16	10	2.9	119.1
1994	34	52	407	108,824	0.32	11,729	9	71	3.0	118.8
1995	48	81	665	105,967	0.32	18,782	5.6	21	3.0	118.2
1996	41	50	264	74,752	0.22	10,453	7.1	36	3.0	117.1
1997	13	15	100	32,606	0.09	2,982	10.9	14	2.8	115.7

[a] Deadloss included in total.
[b] Millions of pounds.
[c] No summer commercial fishery.
[d] Information not available.

Appendix Table 3. Historic summer commercial red king economic performance, Norton Sound Section, Bering Sea, 1977 - 1997.

Year	Guidline Harvest Level (lbs) [b]	Legal Male Pop. Est.(lbs) [b]	Commercial Harvest (lbs) [a,b]	Number of Vessels	Number of Permits	Number of Landings	Number of Pots Registered	Number of Pots Pulls	Exvessel Price/lb	Fishery Value (millions $)	Season Length Days	Season Length Dates
1977	[d]	10.0	0.52	7	7	13	[d]	5,457	0.75	0.229	60	[d]
1978	3.00	11.0	2.09	8	8	54	[d]	10,817	0.95	1.897	60	6/7-8/15
1979	3.00	5.4	2.93	34	34	76	[d]	34,773	0.75	1.878	16	7/15-7/31
1980	1.00	6.6	1.19	9	9	50	[d]	11,199	0.75	0.890	16	7/15-7/31
1981	2.50	4.7	1.38	36	36	108	[d]	33,745	0.85	1.172	38	7/15-8/22
1982	0.50	1.3	0.23	11	11	33	[d]	11,230	2.00	0.405	23	8/9-9/1
1983	0.30	2.1	0.37	23	23	26	3,583	11,195	1.50	0.537	3.8	8/1-8/5
1984	0.40	2.7	0.39	8	8	21	1,245	9,706	1.02	0.395	13.6	8/1-8/15
1985	0.45	2.4	0.43	6	6	72	1,116	13,209	1.00	0.427	21.7	8/1-8/23
1986	0.42	2.8	0.48	3	3	[d]	578	4,284	1.25	0.600	13	8/1-8/25 [e]
1987	0.40	2.2	0.33	9	9	[d]	1,430	10,258	1.50	0.491	11	8/1-8/12
1988	0.20	3.2	0.24	2	2	[d]	360	2,350	[d]	[d]	9.9	8/1-8/11
1989	0.20	3.2	0.25	10	10	[d]	2,555	5,149	3.00	0.739	3	8/1-8/4
1990	0.20	3.2	0.19	4	4	[d]	1,388	3,172	[d]	[d]	4	8/1-8/5
1991 [c]	0.34	3.4										
1992	0.34	3.4	0.07	27	27	[d]	2,635	5,746	1.75	0.130	2	8/1-8/3
1993	0.34	3.4	0.33	14	20	208	560	7,063	1.28	0.430	52	7/1-8/28 [f]
1994	0.34	3.4	0.32	34	52	407	1,360	11,729	2.02	0.646	31	7/1-7/31
1995	0.34	3.4	0.32	48	81	665	1,900	18,782	2.87	0.926	67	7/1-9/5
1996	0.34	3.4	0.22	41	50	264	1,640	10,453	2.29	0.519	57	7/1-9/3 [g]
1997	0.08	1.6	0.09	13	15	100	520	2,982	1.98	0.184	44	7/1-8/13 [h]

[a] Deadloss included in total.
[b] Millions of pounds.
[c] No summer commercial fishery.
[d] Information not available.
[e] Fishing actually began 8/12.
[f] Fishing actually began 7/8.
[g] Fishing began 7/9 due to fishermen's strike.
[h] First delivery was made 7/10.

Appendix Table 4. Comparison of percent recruit and postrecruit red king crab sampled from summer commercial harvest, Norton Sound Section, Eastern Bering Sea, 1983 - 1997.

	Summer Commercial	
	Recruits	Postrecruits
Year	(%)	(%)
1983	55	45
1984	59	41
1985	45	55
1986	48	52
1987	22	78
1988	25	75
1989	23	77
1990	21	79
1991 [a]		
1992	28	72
1993	31	69
1994	14	86
1995	36	64
1996	30	70
1997	49	51

[a] No data collected in summer 1991 due to closed fishery.

Appendix Table 5. Results of the population assessment surveys conducted for red king crab in Norton Sound since 1976.

					Number of Red King Crab Captured [a]			Population Estimates of Legal Male Crab[c]	
Year	Date	Research Agency	Vessel	Gear Effort	Sublegal Males	Legal[b] Males	Females	Numbers	Pounds
1976	9/02 - 9/05 9/16 -10/07	NMFS	Miller-Freeman	Trawl 158 tows	768	555	180	3,119,800	8,111,480
1979	7/26 - 8/05	NMFS	Miller-Freeman	Trawl 71 tows	46	194	40	837,241	2,511,723
1980	7/04 - 7/14	ADF&G	Altair	Pots 397 lifts	443	3,290	158	1,900,000	6,600,000 [d]
1981	6/28 - 7/14	ADF&G	Altair	Pots 718 lifts	4,097	3,415	1,933	1,285,195	4,755,221
1982	7/06 - 7/20	ADF&G	Aleutian #1	Pots 689 lifts	5,019	2,001	424	353,273	1,271,783
1982	9/05 - 9/11	NMFS	Miller-Freeman	Trawl 50 tows	322	107	265	970,646	2,620,744
1985	7/01 - 7/14	ADF&G	Arctic Sea	Pots 642 lifts	6,086	4,645	181	907,579	2,414,644
1985	9/16 -10/01	NMFS	Argosy	Trawl 78 tows	266	163	151	1,203,000	3,369,000
1988	8/16 - 8/30	NMFS	Miller-Freeman	Trawl 82 tows	258	141	218	1,037,000	3,038,000
1991	8/22 - 8/30	NMFS	Ocean Hope	Trawl 53 tows	202	178	105	1,384,000	4,009,000 [e]
1996	8/7 - 8/18	ADF&G	Peggy Jo	Trawl 69 tows	250	67	168	534,446	1,603,339

[a] Number of crab captured on ADF&G surveys represent data standardized for a 24 hour soak.

[b] Legal male red king crab were defined as at least 106mm in carapace length for the 1976 NMFS survey; 105mm for the 1979 and 1985 NMFS survey; and at least 121mm in carapace width for all ADF&G surveys.

[c] Population estimates are valid for the date of the survey, ie either before or after the summer commercial fishery.

[d] The 1990 estimate has been revised from the original estimate of 13.4 million pounds. The original estimate was thought inaccurate due to under-reporting of recovered tagged crab.

[e] Population for the entire sound is recorded here, but only 3,400,000 pounds were estimated in waters open to the summer commercial fishery which was used as the basis for setting the quota.

Appendix Table 6. Winter commercial and subsistence red king crab harvests, Norton Sound 1978-1997.

Commercial			Subsistence						
Year[a]	Fishermen	# Crab Harvested	Winter[b]	Permits Issued	Permits Returned	Permits Fished	Total Crab Caught[c]	Total Crab Harvested[d]	Average Harvest/fm
1978	37	9,625	1977-78	290	206	149	[e]	12,506	84
1979	1	221	1978-79	48	43	38	[e]	224	6
1980	1	22	1979-80	22	14	9	[e]	213	24
1981	0	0	1980-81	51	39	23	[e]	360	16
1982	1	17	1981-82	101	76	54	[e]	1,288	24
1983	5	549	1982-83	172	106	85	[e]	10,432	123
1984	8	856	1983-84	222	183	143	15,923	11,220	78
1985	9	1,168	1984-85	203	166	132	10,757	8,377	63
1986	5	2,168	1985-86	136	133	107	10,751	7,052	66
1987	7	1,040	1986-87	138	134	98	7,406	5,772	59
1988	10	425	1987-88	71	58	40	3,573	2,724	68
1989	5	403	1988-89	139	115	94	7,945	6,126	65
1990	13	3,626	1989-90	136	118	107	16,635	12,152	114
1991	11	3,800	1990-91	119	104	79	9,295	7,366	93
1992	13	7,478	1991-92	158	105	105	15,051	11,736	112
1993	8	1,788	1992-93	88	79	37	1,193	1,097	30
1994	25	5,753	1993-94	118	95	71	4,894	4,113	58
1995	42	7,538	1994-95	167	71	57	5,918	4,059	71
1996	9	1,778	1995-96	84	44	35	2,936	1,679	48
1997	2	83	1996-97	38	18	10	1,198	706	71

[a] Prior to 1985 the winter commercial fishery occured from January 1 - April 30; As of March 1985, the winter commercial harvest may occur from November 15 - May 15.

[b] The winter subsistence fishery occurs during months of two calander years (as early as December, through May).

[c] The Number of crab actually caught; some may have been returned.

[d] The number of crab harvested is the number of crab caught and kept.

[e] Data unavailable.